CLAIMS

1. A method of growing a crystal on a substrate disposed in a reactor that provides a reactor chamber in which the substrate is disposed, the method comprising:

flowing reactive gases inside the reactor chamber toward the substrate, the reactive gases comprising components that are able to bond to each other to form the crystal;

heating a buffer gas; and

flowing the heated buffer gas in the reactor chamber between the reactive gases and a wall of the reactor such that the reactive gases and the buffer gas can interact;

wherein the flowing buffer gas inhibits at least one of a first material at least one of in and produced by the reactive gases from reaching the reactor wall and a second material produced by the reactor wall from reaching the reactive gases in the reactor chamber before the reactive gases reach the substrate.

2. The method of claim 1 further comprising using the buffer gas to heat the reactive gases sufficiently to react to form a desired material before reaching the substrate, the desired material for forming a desired crystal on the substrate.

3. The method of claim 1 further comprising expelling unused portions of the reactive gases and the buffer gas from the chamber, wherein the buffer gas flows at a speed such that substantially none of the first material reaches the reactor wall and substantially none of the second material reaches the reactive gases inside the reactor chamber.

4. The method of claim 1 wherein the buffer gas comprises at least a third material configured to react with at least one of the first and second materials to form at least one inert, stable material.

5. The method of claim 1 wherein the buffer gas comprises at least one inert gas.

6. The method of claim 5 wherein the at least one inert gas comprises at least one of helium and argon.

7. The method of claim 1 wherein the reactive gases comprise at least one of a dopant and an etchant that will react with the reactor wall to produce the second material.

8. The method of claim 7 wherein the reactive gases comprise the etchant and the etchant is hydrogen.

9. The method of claim 1 wherein the reactive gases include at least one of silane, silicon tetrachloride, and trimethylsilane, and at least one of methane and propane.

10. The method of claim 1 further comprising heating the reactor wall.

11. The method of claim 10 wherein at least one of the reactor wall, the buffer gas, and the substrate seat is heated to control a temperature difference between a temperature of the reactive gases and a temperature of the substrate.

12. The method of claim 11 wherein the difference is maintained between about 5°C and about 200°C.

13. The method of claim 1 further comprising mixing all components of the reactive gases before flowing the reactive gases in the reactor chamber.

14. The method of claim 1 further comprising flowing components of the reactive gases separately into the reactor chamber to inhibit mixing of the components prior to introduction into the chamber.

15. The method of claim 1 further comprising expelling the buffer gas at least one of in a direction parallel to an axis of the reactor and through at least one opening defined in the reactor wall.

16. The method of claim 1 wherein the reactive gases comprise one of the following groups of elements: silicon and carbon, aluminum and nitrogen, gallium and nitrogen, aluminum and gallium and nitrogen, and alloys of any of the preceding groups.

17. The method of claim 1 wherein the reactive gases include gases for growing crystals of at least one of SiC, a group III-V compound, and an alloy of SiC or a group III-V compound.

18. A reactor system for growing a crystal on a substrate, the reactor system comprising:

a housing comprising a first, inlet end, and a second, outlet end, the inlet end defining a reactive stream intake port and a buffer stream intake port, the outlet end defining at least one output port;

a base coupled to the outlet end of the housing and configured to receive the substrate;

a reactive gas injector configured to inject reactive gases into the housing through the reactive stream intake port to produce a reactive stream of the reactive gases;

a buffer gas injector configured to inject buffer gas into the housing through the buffer stream intake port to produce a buffer stream of the buffer gas; and

a first heat source configured and disposed to heat the buffer stream;

wherein the inlet end, the reactive gas injector, and the buffer gas injector are configured such that the heated buffer stream is disposed between the reactive stream and a wall of the housing and inhibits components of or produced in the reactive stream from reaching the housing wall and inhibits materials produced or emitted by the housing wall from reaching the reactive stream before the reactive stream reaches the substrate.

19. The system of claim 18 wherein the inlet end is configured to keep the reactive stream and the heated buffer stream separate until an interaction location inside the housing.

20. The system of claim 19 further comprising a second heat source configured and disposed to heat the housing wall substantially between points even with the interaction location and the substrate.

21. The system of claim 18 wherein the first heat source is configured to heat the buffer stream to a sufficient temperature such that when the buffer stream interacts with the reactive stream, the buffer stream will heat the reactive stream enough to cause the reactive gases to react with each other to form a desired material before reaching the substrate, the desired material for forming a desired crystal on the substrate.

22. The system of claim 18 further comprising a substrate-heating source configured and disposed to heat the substrate to maintain a temperature difference between a temperature of the reactive stream and a temperature of the substrate.

23. The system of claim 22 wherein the difference is maintained between about 5°C and about 200°C.

24. The system of claim 18 wherein the housing defines at least one opening in the housing wall along a length of the housing.

25. The system of claim 24 wherein the housing defines a plurality of openings in the housing wall along the length of the housing and wherein sizes of the openings provide modulated outflow of at least the buffer gas from the housing along the length of the housing.

26. The system of claim 25 further comprising:

an outer shell disposed about and separated from the housing along the length of the housing to define a passageway between the shell and the housing; and

an apparatus configured and disposed to induce flow of gas out of the passageway.

27. A reactor system for growing a crystal on a substrate, the reactor system comprising:

a housing comprising a first, inlet end, and a second, outlet end, the inlet end defining a reactive stream intake port, the outlet end defining at least one output port;

a base coupled to the outlet end of the housing and configured to receive the substrate;

an apparatus configured and disposed to provide a gas flow into the housing through the reactive stream intake port; and

means for heating the gas flow between the intake port and the substrate and for isolating at least one of the gas flow components from a wall of the housing and materials emitted from the housing wall from the gas flow, wherein the means for heating the gas flow is configured to do so independently of heat emanating from the housing wall.

28. The system of claim 27 wherein the means for heating is configured to inject a heated stream of at least one buffer gas that is unlikely to react with the gas flow components, the at least one buffer gas being at a sufficient temperature to heat the gas flow components enough such that gas flow components will react with each other.

29. The system of claim 27 further comprising means for heating the housing wall.

30. The system of claim 29 further comprising means for heating the substrate to maintain a desired temperature difference between a maximum temperature of the gas flow and a temperature of the substrate.

31. The system of claim 30 wherein the desired temperature difference is between about 5°C and about 200°C.

32. The system of claim 27 wherein the housing defines at least one opening in the housing wall along a length of the housing.

33. The system of claim 32 wherein the housing defines a plurality of openings in the housing wall with different sizes along the length of the housing.

34. The system of claim 27 further comprising:

an outer shell disposed about and separated from the housing along the length of the housing to define a passageway between the shell and the housing; and

an apparatus configured and disposed to induce flow of gas out of the passageway.